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WAR DEPARTMENT

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TECHNICAL MANUAL

ORDNANCE MAINTENANCE

**TELESCOPE M6
AND TELESCOPE MOUNT M19**

October 2, 1941



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TECHNICAL MANUAL }
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WAR DEPARTMENT,
WASHINGTON, October 2, 1941.

ORDNANCE MAINTENANCE

TELESCOPE M6 AND TELESCOPE MOUNT M19

Prepared under direction of the
Chief of Ordnance

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1. **General.**—*a. Purpose.*—This manual is published primarily for the information and guidance of ordnance maintenance personnel.

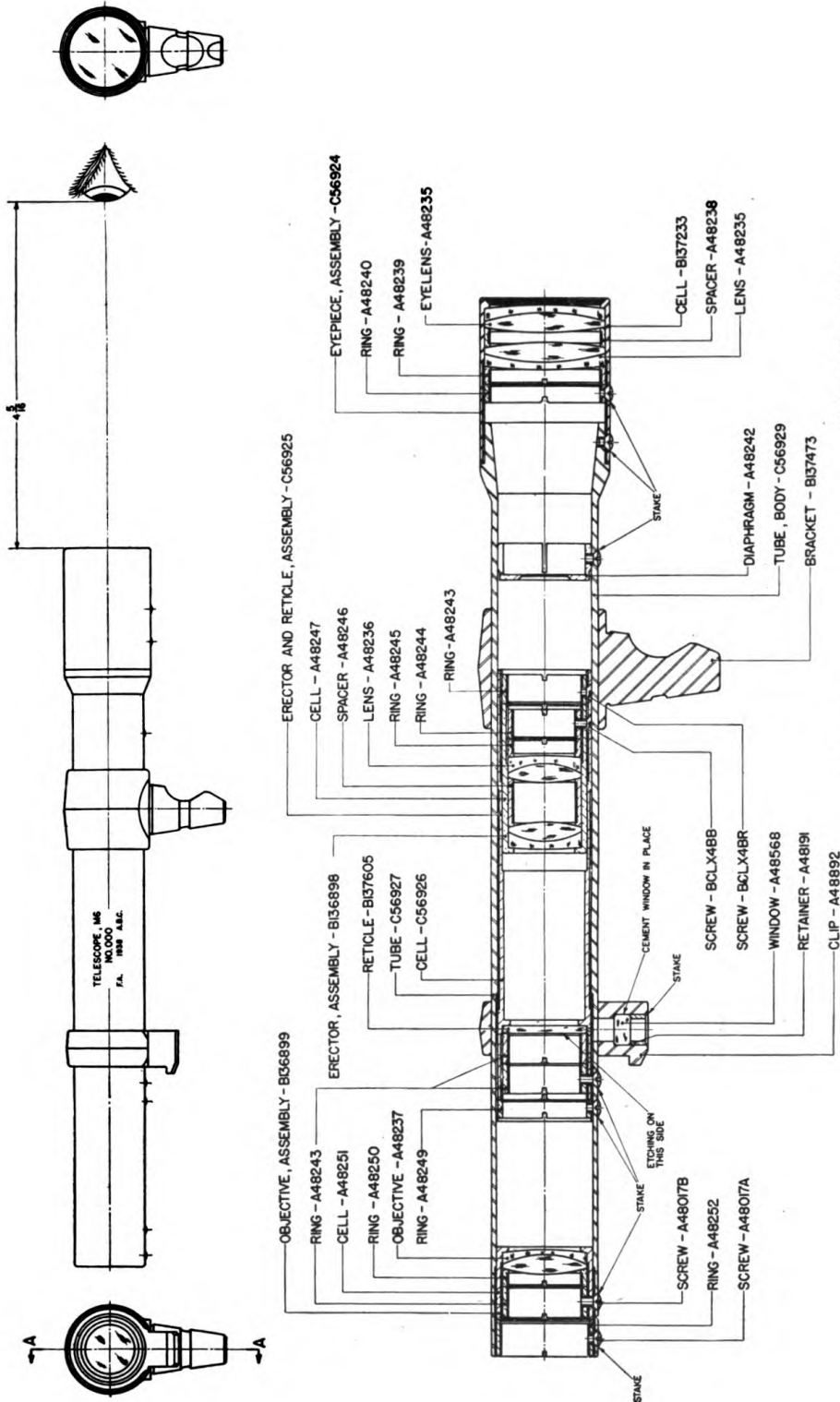
b. Scope.—This manual supplements the Technical Manuals which are prepared for the using arm. It contains general descriptive matter and detailed instructions for the maintenance and repair of the telescope and telescope mount by ordnance personnel. Figures which accompany the text show the placement and method of fastening of each of the component parts of the telescope and telescope mount.

c. References.—Standard Nomenclature Lists and other publications pertaining to the telescope and telescope mount are listed in the appendix.

2. **Description and operation.**—*a. General.*—The telescope M6 and telescope mount M19 comprise the standard on-carriage sighting equipment for the 37-mm antitank gun M3 and carriage M4. The telescope mount is assembled to the left side of the top carriage, behind and slightly above the cradle trunnions. The telescope has a reticle which is graduated for various leads and ranges. No external means for introducing these quantities is provided. A parallelogram linkage maintains parallelism between the telescope and bore axes. Provision is made for illumination of the reticle.

b. Telescope M6.—The telescope M6 is a straight tube telescope with no magnification (figs. 1 and 2).

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SECTION A-A

FIGURE 2.—Telescope M6—assembled and sectioned views.

(2) The optical system includes the objective, A48237 (fig. 2), the reticle, B137605, illuminated through the window, A48568, two erecting lenses, A48236, a diaphragm, A48242, and the eyelenses, A48235.

(3) The reticle is graduated for various ranges and leads as shown in figure 3. It should be noticed that the center of the etched circle does not coincide with the center of the reticle.

(4) The front clip, A48892, and the rear bracket, B137473, locate and secure the telescope on the telescope holder, D29038 (fig. 4).

c. Telescope mount M19.—The telescope mount supports the telescope and includes the parallelogram linkage which keeps the telescope parallel to the gun (figs. 1 and 4).

(1) The link assembly which includes the adapter, A47996, the screw, A48747, the tube, A48749B, and the link adapter, A46899, is adjustable for orienting the telescope in elevation. The lock nuts, A48742 and A48743, maintain the setting of the linkage.

(2) The telescope fits in a slot and tapered hole in the telescope holder, D29038, and is locked in position with the cam, C69759. The telescope holder contains the lamp and window, A48568, for illuminating the reticle.

(3) The lamp is a No. 10 Mazda G 3½ flashlight type with a miniature screw base. A cable and plug assembly connects the lamp to the two standard tubular flashlight cells in the battery compartment of the tool case. The tool case is mounted on and supplied with the gun carriage and includes a switch for turning the lamp on and off.

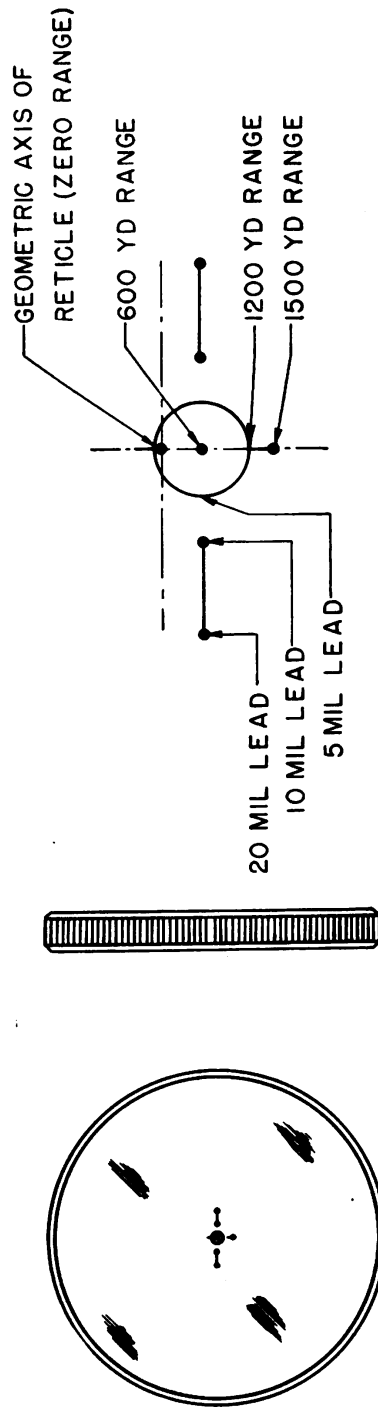
d. Operation.—(1) The operation of the telescope mount M19 and telescope M6 is entirely automatic. The limits of operation are governed by the gun carriage which restricts the telescope motion to 10° depression, 15° elevation, and 30° right and left traverse, with respect to any setting of the trails.

(2) Install the telescope by hooking the clip into telescope holder, D29038, and then locating and locking the telescope in place with the cam, C69759.

(3) Connect the cable and plug assembly to the lamp socket in the telescope holder and to the batteries.

(4) To aim the gun, turn the elevating and traversing mechanism, viewing the target through the reticle, until the dot on the reticle which indicates the proper lead and range (fig. 3) is imposed on the target.

3. Installation.—*a.* To reinstall an assembled mount to a carriage, bolt the bracket, C56581, to the carriage after seating the two dowel pins, BFDX5R. Bolt the arm, B137475 (fig. 3, sec. A-A-A), to the cradle trunnion.



ENLARGED VIEW OF ETCHINGS

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FIGURE 3.—Telescope M6—reticle and reticle graduations.

RETICLE

b. To install a new mount to the carriage, bolt the bracket, C56581, to the carriage, and then bolt the arm, B137475 (fig. 3, sec. A-A-A), to the cradle trunnion. Orient the mount and telescope and drill the holes in the brackets for the locating pins, using the locating pinholes in the carriage as a guide.

c. Adjust the linkage as indicated in paragraph 5c(1).

d. Bore sight the gun, aiming at a fairly distant target. Bring the telescope to bear on the target by adjusting the eccentric, A46893, in the telescope holder and the eccentric, A46893, in the arms, B137475 and B137476, as described in paragraph 5c(1).

4. Inspection.—Inspection is made for the purpose of determining the condition of the telescope and telescope mount, whether repairs or adjustments are required, and the remedies necessary to insure serviceability and proper functioning.

a. Telescope M6.

Parts to be inspected

Points to be observed

(1) Exposed mechanical parts.

(1) Observe general appearance and bent or missing parts.

(2) Optical system.

(2) Note if checks or frost marks appear in the field of view. Such defects are evidence of loosening of the balsam used in cementing lenses and, if severe, require the return of the telescope to an arsenal for overhaul. Note presence of objectionable scratches or cracks in lenses or reticle.

(3) Reticle.

(3) Test the horizontal lines of the reticle against a true horizontal line.

(4) Clip and bracket.

(4) The clip and bracket should fit smoothly into the telescope mount.

b. Telescope mount M19.

(1) Exposed mechanical parts.

(1) Observe general appearance and any damaged or missing parts.

(2) Ball bearing joints.

(2) All ball-bearing joints should have smooth movement and should not turn too tightly nor too loosely.

Parts to be inspected

(3) Cam, eccentrics, and nuts.

(4) Illumination.

Points to be observed

(3) The cam, C69759, and eccentrics, A46893, should function properly. Locking nuts, A48742 and A48743, should not be marred.

(4) Check wiring and lamp socket for loose fastenings or evidence of wear. Windows should be clean.

5. Maintenance and repair.—*a. Tools.*—The optical repair kit for Field Artillery, furnished to ordnance companies, contains necessary tools, fixtures, cements, oil, etc., for use with the telescope and telescope mount. A complete list of the items comprising the kit is contained in a blueprint which is fastened in the cover of the chest. Every item in the kit is designated by a number equivalent to the compartment number. Most of the items as screw drivers, etc., require no description as their uses are self-explanatory. The collimating telescope, No. 90, which is furnished with the kit is an ordinary nonerecting type. It is adjusted for parallax by focusing the eyepiece on the crosswires and then removing parallax by focusing the objective, temporarily loosening the drawtube clamping screw in the side of the telescope for the purpose. The magnifying power of the collimating telescope is 9.78X; the field of view is 4°20'.

b. Disassembly and assembly.—Disassembling may be required for cleaning or repair. The telescope should be returned to a base shop or arsenal if repairs or adjustments require disassembly that involves realinement, removal, or replacement of optical parts. Other repairs which cannot be made with the facilities available also necessitate the return of the telescope or mount to a base shop or arsenal. Assembly is made by reversing steps taken in disassembly except where indicated. Figures 1 to 4, inclusive, indicate relationship of parts.

(1) *Telescope M6.*—Repair of the telescope should be governed by the instructions in *a* above.

(2) *Telescope mount M19.*—(a) *Telescope holder.*—After the telescope has been removed, the telescope holder, D29038 (fig. 4, sec. C-C), may be disassembled by withdrawing the adjusting bolt, A46829, and washer, and by disassembling the pinned nut, A46770, and bolt, A46767.

(b) *Cam.*—To withdraw the cam, C69759 (fig. 4, sec. D-D), remove the special retaining screw, A46897.

(c) *Lamp socket assembly.*—The lamp socket assembly, B136897, may be unscrewed after the locking screw has been withdrawn.

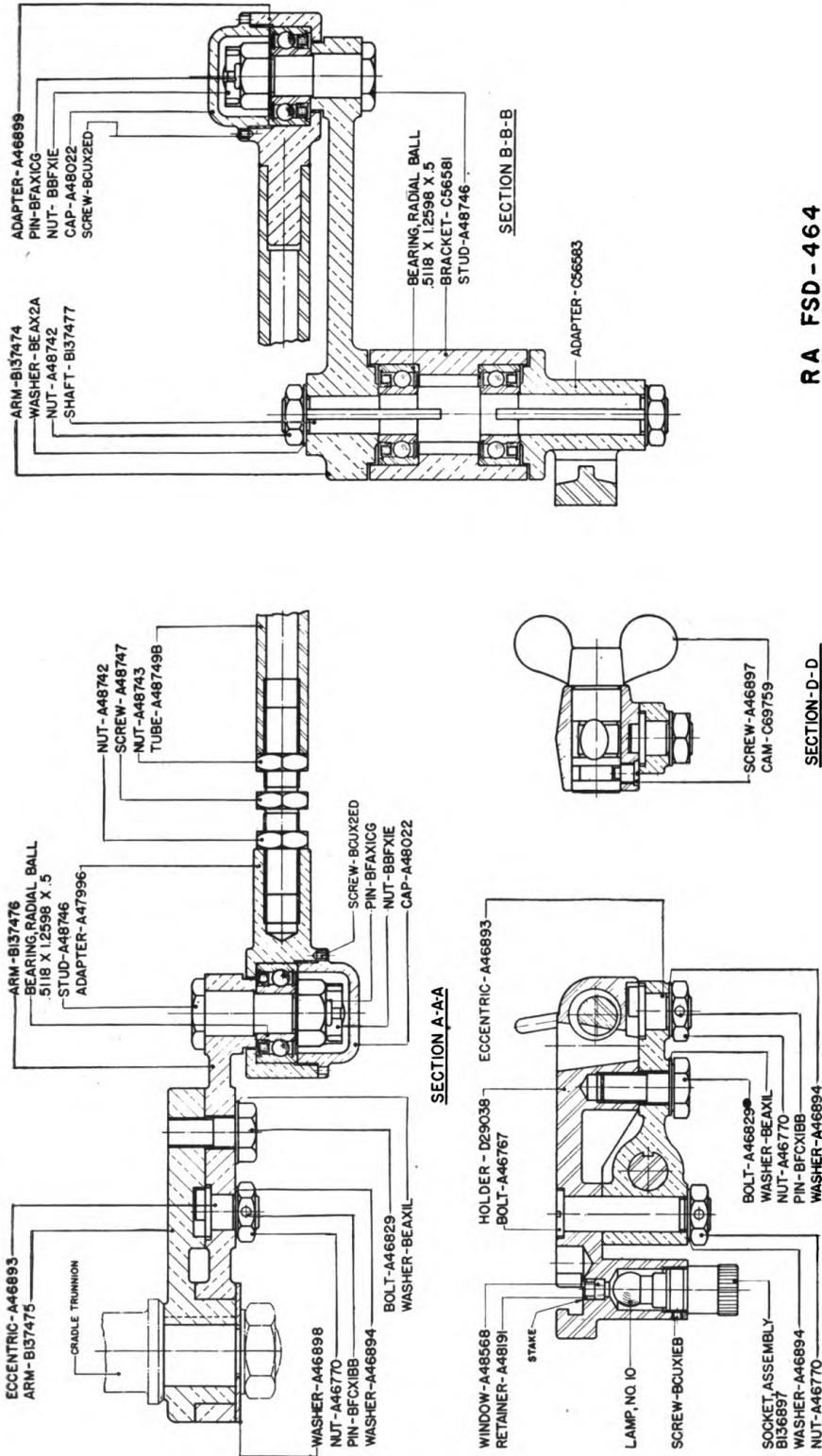


FIGURE 4.—Telescope mount M19—sectioned views.

(d) *Telescope holder adapter*.—To slide the telescope holder adapter, C56583 (fig. 4, sec. B-B-B), off the keyed shaft, B137477, remove the retaining hexagon nut and washer.

(e) *Male link adapter assembly*.—The male link adapter assembly (see adapter, A46899, fig. 4, secs. A-A-A and B-B-B) may be removed by unscrewing the screw, A48747, from the tube, A48749B, and by disconnecting the adapter, A46899, from the stud, A48746. To disconnect the adapter, unscrew the cap, A48022, the cotter pin, BFAX1CG, and the castle nut, BBFX1E. The ball bearing is then accessible.

(f) *Female link adapter assembly*.—The female link adapter assembly may be disassembled in a manner similar to that followed for the male link adapter assembly.

(g) *Carriage bracket arm*.—To remove the carriage bracket arm, B137474, unscrew the hexagon nut and slide the keyed arm off the shaft. The shaft, B137477, and bearings may then be removed from the bracket, C56581.

(h) *Carriage bracket*.—The bracket, C56581, may be removed from the gun carriage after withdrawing four hexagon head bolts, BCBX1BC, and nuts (fig. 1).

(i) *Gun cradle arm*.—The gun cradle arm, B137475 (fig. 4, sec. A-A-A), may be removed from the gun cradle adjusting arm, B137476, by unscrewing the bolt, A46829, after the mount has been removed from the cradle trunnion.

(j) *Eccentrics*.—The eccentrics, A46893 (fig. 4, sec. A-A-A and C-C), may be disassembled after removing the retaining pins and unscrewing the hexagon nuts, holding the cam end against turning.

c. *Adjustment*.—Two separate adjustments are necessary for the accurate alinement of the telescope. They should be made in the following order:

(1) *Linkage*.—Verify the linkage adjustment by placing a gunner's quadrant set at zero on flat surface of breech housing and level the gun. Transfer quadrant to flat surface of telescope holder and read angular difference between telescope holder and axis of bore. Elevate gun fully and then depress gun fully, comparing angular differences between telescope holder and axis of bore at each of these points. If the difference varies by more than one mil, the screw, A48747, should be adjusted.

(a) If the telescope holder gains elevation at the point of maximum elevation and loses elevation at the point of maximum depression the screw, A48747, should be adjusted to lengthen the link assembly.

(b) If the telescope holder loses elevation at the point of maximum elevation and gains elevation at the point of maximum depression the screw, A48747, should be adjusted to shorten the link assembly.

(c) This adjustment requires the loosening of hexagon nuts, A48742 and A48743. The telescope mount should be rechecked for alinement after the nuts have been secured.

(2) *Telescope.*—(a) Before adjusting the telescope, set up the gun and testing target as described in FM 23-70, paragraph 27c(3).

(b) Aline the telescope in azimuth by adjustment of the eccentric, A46893, in the telescope holder.

(c) Aline the telescope in elevation by adjustment of the eccentric, A46893, in the gun cradle arms, B137475 and B137476.

(d) The clamping bolts, A46829, should be tightened after adjustment.

(e) The linkage adjustment must not be disturbed while making this adjustment.

(3) *Interchangeable.*—Telescopes and telescope mounts are not interchangeable without adjustment. Each telescope and telescope mount used with the same gun must be adjusted on installation.

6. Care and preservation.—*a. Care in handling.*—(1) Avoid denting or nicking of the locating surfaces of the telescope holder or telescope.

(2) Keep clamping bolts and other bolts and nuts on telescope mount securely tightened at all times.

(3) Keep the windows in the telescope and telescope holder clean to insure maximum illumination of the reticle.

(4) Keep the dust cap on the telescope when the telescope is not in use.

(5) When the telescope and telescope mount are not in use or when the gun is prepared for travel, the telescope should be placed in its carrying case on the carriage.

b. Lubrication.—The mount should be lubricated occasionally with lubricants furnished by the Ordnance Department for fire-control instruments.

(1) The lubricants commonly used are—

(a) Oil, lubricating, for aircraft instruments and machine guns.

(b) Grease, special, low temperature. This lubricant is used where a soft or medium grease is required.

(2) The ball bearings are lubricated in manufacture and are sealed against further lubrication.

(3) External contact surfaces should be sparingly greased or oiled.

c. Optical parts.—(1) To obtain satisfactory vision, it is necessary to keep the exposed surfaces of the lenses and other parts clean and dry. Corrosion and etching of the glass surfaces can thus be prevented or retarded.

(2) Moisture due to condensation may collect on the optical parts of the telescope when the temperature of the telescope is below that of the surrounding air. This may be removed by placing the telescope in a warm place. Heat from strongly concentrated sources should never be applied directly as it may cause unequal expansion of parts with resulting inaccuracies in observation.

(3) For dusting optical parts, use only a clean camel's-hair brush. For wiping, use only paper, tissue, which is specially intended for cleaning optical glass.

(4) To remove oil or grease from optical surfaces, apply ethyl alcohol with a clean camel's-hair brush and rub gently with paper, tissue. If alcohol is not available, breathe on the glass and wipe off with paper, tissue; repeat this operation several times until clean.

(5) To remove dust, brush the glass lightly with a clean camel's-hair brush and rap the brush against a hard body in order to knock out dust particles clinging to the hairs. Repeat until dust is removed.

(6) Do not wipe lenses or windows with the fingers.

(7) Polishing liquids or pastes are not to be used for polishing lenses or windows.

7. Accessories.—*a. Cable and plug assembly.*—A cable and plug assembly about 24 inches long for connection between the lamp socket assembly and the battery is carried in the tool box when not in use.

b. Dust cap.—A dust cap, consisting of two leather caps connected by a strap, covers both ends of the telescope when the telescope is not in use.

c. Wrench.—A double-offset box wrench ($\frac{5}{8}$ by $\frac{9}{16}$ inch) is furnished for use in attaching the telescope mount M19 to the gun carriage and for adjustment.

APPENDIX

LIST OF REFERENCES

1. Standard Nomenclature Lists.

Optical repair kit for Field Artillery	-----	SNL F-21
Telescope M6	}-----	SNL F-184
Telescope mount M19		

2. Technical Manuals.

Cleaning and preserving material----- TM 9-850
(now published as TR 1395-A)

Matériel inspection and repair----- TM 9-1100

37mm gun M3 and carriage M4----- TM 9-1245

3. Field Manual.

37-mm gun, antitank, M3----- FM 23-70

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BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

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The Adjutant General.

DISTRIBUTION :

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(For explanation of symbols see FM 21-6.)

